DIOPHANTINE ANALYSIS.

126. Proposed by R. A. THOMPSON, M. A., C. E., Engineer Railroad Commission of Texas.

Eight persons wish to play a series of games of progressive duplicate whist. In one evening, 12 boards are played, 4 boards (and return) by one couple against each of the other three couples, the same partners being retained throughout one evening. How many evenings will be required to complete the series, and what is the order of play, it being required that each player shall play with every other player as partner, and that each couple shall play once and but once against every other couple.

Solution by A. H. HOLMES, Brunswick, Maine.

The order of play would be as follows, the first eight letters representing the players:

$$\left.\begin{array}{l} A-B \text{ vs. } C-D \text{ and } E-F \text{ vs. } G-H \\ A-B \text{ vs. } E-F \text{ and } C-D \text{ vs. } G-H \\ A-B \text{ vs. } G-H \text{ and } C-D \text{ vs. } E-F \end{array}\right\} \text{first evening.}$$

The arrangement of couples for the second evening would be: A–C vs. B–D and E–G vs. F–H, alternating as first evening.

Third evening: A–D vs. F–G and B–C vs. E–H.

Fourth evening: A–E vs. B–F and C–G vs. D–H.

Fifth evening: A–F vs. B–G and C–H vs. D–E.

Sixth evening: A–G vs. B–H and C–E vs. D–F.

Seventh evening: A–H vs. C–F and B–E vs. D–G.

It would therefore take seven evenings to *make* the series, or six evenings to *complete* the series.

AVERAGE AND PROBABILITY.

159. Proposed by J. E. SANDERS, Hackney, Ohio.

A box contains n tickets numbered from 1 to n. How many draws, on the average, will it take to draw all the numbers, each ticket being replaced before drawing again? What is the numerical result for $n=2$ and $n=6$?

REMARKS. Mr. Corey and the Proposer insist that the published solution of this problem in the May Number is incorrect. Mr. Sanders gets for $n=2$, $p=\frac{1.2}{2}+\frac{1.3}{2^2}+\frac{1.4}{2^3}+\frac{1.5}{2^4}+\ldots\ldots=3+$; and for $n=3$, $p=\frac{2.3}{3^2}+\frac{2.4}{3^2}+\frac{14.5}{3^4}+\frac{10.6}{3^4}+\frac{62.7}{3^8}+\ldots\ldots$, the sum of the first ten terms of which is 5.1. From a large number of actual trials, he obtained the following results: $n=2$, $p=2.9$; $n=3$, $p=5.5$; $n=4$, $p=8.5$; $n=5$, $p=12.31$; $n=6$, $p=15.67$; $n=8$, $p=22.66$; $n=12$, $p=41$,—values which are (he observes) approximately equal to $\sqrt{n^3}$.